**Grade level:** 9th  **Content:** Order of Operations

**Lesson: Co-teaching Using Order of Operations to Solve Algebraic Expressions**

**Next Generation Sunshine State Standards/Benchmarks:**

MA.912.A.1.1: Know equivalent forms of real numbers (including integer exponents and radicals, percents, scientific notation, absolute value, rational numbers, irrational numbers).

**Lesson Objective:** By the end of the lesson, the student will be able to evaluate numerical and algebraic expressions by using the order of operations.

**Alternative outcomes/objectives:** Students will recognize that when solving mathematic problems they should follow strict rule in order to have the correct answer. Students will be able to use a mnemonic device to help them remember whole sequence of procedure of solving algebraic equations.

**Prior Knowledge/Preskills:** Students will be familiar with the basic mathematical operations (addition, subtraction, division and multiplication). Students will have skills in write mathematical expression.

**Materials:**

Glencoe Mathematics: Algebra 1

Computers in class

Teacher’s PowerPoint presentation

Hand-out (Order of Operations problems)

Vocabulary words

Projector

Paper

Pencil

**Motivation:** Students will watch the following video clip http://www.youtube.com/watch?v=VvlhJ64ID9Q&feature=related

**Teacher-directed Instruction**

Model of instruction – Parallel teaching and small groups.

**Model of Instruction**:

|  |  |
| --- | --- |
| **Content Teacher** | **Special Education Teacher** |
| -**Opening**  Review two problems of writing algebraic expression. Then, write a problem numerical expression that contains more than one operation. Ask students how to approach solving the problem. Show the video clip. (**Motivation**)  -**Overview**  Explain to students what they are going to learn and why it is important.  Write 3+2X5-3(12/4) on the white board in the beginning of the class, and ask for someone to solve this problem. Ask for students to share their answers. Students will see that there are many ways to solve the same problem.  Refer to the video about the steps in solving numerical expressions. Demonstrate how they can remember the steps using mnemonic device (PE MDAS---Parenthesis, exponents, multiplication, division, addition, and subtraction) students will practice solving the mnemonic PEMDAS as a large group together, in small groups, and individually.  **-Review**  The teacher will review the problems given to the small group and will check the answers of student’s individual work.  The procedure of operation will be reviewed, and students will be asked to tell the order of steps and the right sequence for solving algebraic expressions.  The teacher will review the hand out with the student and ask if there any questions. | Since the model of instruction will use parallel teaching, the special education teacher will follow the same routine as the content teacher. |

**Expectations**

Students are expected to know how to add, subtract, multiply and divide. The lesson will focus on the steps needed, rather than the operations themselves. Students will learn how to use mnemonic device to help them remember them steps in right sequence. Students will work in small groups and individually.

**Rationale**

It is important to provide explicit instruction because many students are not able to pick up the rules, procedures without clear, written instructions. By teaching mnemonics, students are able to remember the order of operations. Also the small groups will help engage the students in interactive dialogue which will help them process the steps as discuss it.

**Guiding Questions**

1. What are the steps in solving algebraic expressions?(Recall-Low)
2. Why do you think you need to follow the steps?(Comprehension)
3. What would happen if a step is skipped?(Analysis)
4. Can you create another way to help remember the steps?(Synthesis)

**Closure**

For the next few days, we will work on solving more algebraic expression, some other problems will have multiple steps. As long as you remember and follow the steps, you will always be able to solve the problems. Tomorrow, you will have the opportunity to practice more in small groups and on the computer.

**Assessment**

The teacher will randomly check student work throughout the lesson. Students will be given a quiz in three days. The teacher will analyze the scores and the problems to see if the lesson needs to be retaught. Students will be given a home-work/assignment to check their understanding and provide extra practice.

**Extensions**

Students may do their individual study by accessing following web site. http://www.quia.com/mc/384662.html. This will give students the opportunity to extend their learning.

**Accommodations/Modifications**

Students should be assisted using the different technologies. Software programs that emphasize specific skills will be used. They can be given specific problems that are simpler or more challenging, and notes that specify the contents each student need to be re-taught. A visual of the PEMDAS steps that is posted on the wall or at the student’s desk, as needed. Checking for understanding throughout the lesson will prevent errors from becoming habit.

**Access Points  
-Independent**

Identify and use equivalent forms of fractions, such as halves, fourths, thirds, sixths, eighths, tenths, and sixteenths; decimals to the hundredths place; and percents, such as 25%, 50%, 75%, 100%, 33%, and 67%, using visual and numerical representation.

Remarks:  
Decimals may include application for money and weight on digital scales.

**-Supported**

Identify equivalent forms of fractions, such as halves, thirds, and fourths; percents, such as 50%, 33%, and 25%; and decimals in the context of money, using visual and numerical representation in real-world situations.   
Remarks:  
1/2 dollar is the same as 2 quarters or $.50; 2/4 of a pizza is the same as 1/2.

**-Participatory**

Identify and express quantity in sets to 10 using objects, pictures, symbols, or number names.

**References**

Holliday, B, Gilbert, C, Daniel, M, Ruth, C, & Moore-Harris, B. (2004). *Algebra 1*. Columbus, Ohio: Glenco.

MathsIsFun.com. (2010). *Order of operations - pemdas*. Retrieved from <http://www.mathsisfun.com/operation-order-pemdas.html>

*Florida department of education*. (2008). Retrieved from <http://www.floridastandards.org/Standards/FLStandardSearch.aspx>

.